



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:)
Xiadong Mao) Group Art Unit: 2615
Application No: 10/650,409) Examiner: Jason R. Kurr
Filed: Aug. 27, 2003) Atty. Docket No:SNYP028
For: AUDIO INPUT SYSTEM) Date: March 12, 2008
)

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Commissioner for Patents, Alexandria, VA 22313-1450 on March 12, 2008.

Signed: _____

Kay Harlow
Kay Harlow

Declaration Under 37 CFR 1.131

Honorable Commissioner for Patents
Alexandria VA 22313-1450

Sir:

I, Xiadong Mao, declare as follows:

1. I am the sole inventor of the above-identified application, which was filed on August 27, 2003;
2. Before April 25, 2003, I conceived and diligently worked on preparation of my patent application entitled "Audio Input System", and assigned U.S. Application No. 10/650,409;
3. I completed an "Invention Disclosure Form" (IDF, 9 pages), which was filed with the legal department of Sony Computer Entertainment America Inc. (SCEA), in Foster City, California. SCEA is a subsidiary of Sony Computer Entertainment Inc. (SCEI), of Tokyo Japan, which is the Assignee of the present application. (See Exhibit A);

4. From a date before April 25, 2003 and up to the filing date of this application, I worked with attorneys Albert S. Penilla and Michael L. Gencarella of Martine Penilla & Gencarella, LLP, to prepare my application for patent;

5. On or about April 2, 2003, I met with and presented a disclosure to attorneys Albert S. Penilla and Michael L. Gencarella;

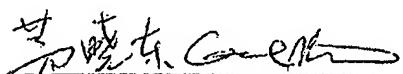
5. On or about July 9, 2003, I received, for review, a draft application from attorney Michael L. Gencarella;

6. On or about July 28, 2003, I received a final draft from attorney Michael L. Gencarella;

7. On or about August 21, 2003, I received formal application papers, including a declaration, for execution after my final review of the application, which was then filed on August 27, 2003;

8. I have reviewed the redacted portions of the IDF, and hereby confirm that such information may be confidential information to the Assignee, and does not add to the details found in the remaining non-redacted portions of the IDF;

9. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.



Xiadong Mao - Inventor

03-12-08

Date

Invention Disclosure Form

This form is provided to permit evaluation of the patent potential of company inventions, and to facilitate preparation of patent applications when warranted. Please fill in each space as completely as possible.

I. SHORT DESCRIPTION OF THE INVENTION

1. Short Summary of the Invention:

This invention considers a microphone sensor array mounted on game controller:

- The physical sensor array placement
- The noise robust voice input that is tailored to the proposed microphone array system

2. Name of product(s), (e.g.; title of game(s) or project(s)), for which this invention was developed:

II. DISCLOSURE

3. Has your invention been disclosed to anyone out side of Sony Computer Entertainment America in a speech, exhibit, presentation, product, product manual, report, lecture, trade show, technical article or publication. Has a prototype already been sold, offered for sale or shown? Please identify the earliest date this happened or otherwise?

No
 Yes (Explanation:)

III. RELATED INVENTION

4. Is this invention related to any previous Invention Disclosures of which you are aware (made by you or someone else)?

No
 Yes (Explanation:)

5. All related information or publications that you know are related to your invention. (If you know, please indicate publication Nos or attach a copy of it to this sheets)

IV. INVENTORS

Identify all persons who contributed to the present invention including persons from other Division, Sony Computer Entertainment Inc. and Outside Companies. Please note that the patent may be invalid, if the correct inventors are not named.

a) *Main Inventor:

Xiaodong Mao



[REDACTED]
Date

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Full Legal Name

Signature

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Home Telephone #:

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Invention disclosure

This invention proposes a novel voice input system built onto the game controller for the game console; the proposed system comprises two layers:

1. The hardware design specification, includes a physical placement of microphone sensor array on controller and the required Analog-to-Digital conversion format
2. The software implementation tailored specifically to the handheld game controller usage model in order to enhance voice signal under arbitrary and extremely noisy environment, in the mean time without posing any constraint on controller's position/orientation/movement

Figure 1 demonstrates the proposed noisy-robust voice input system

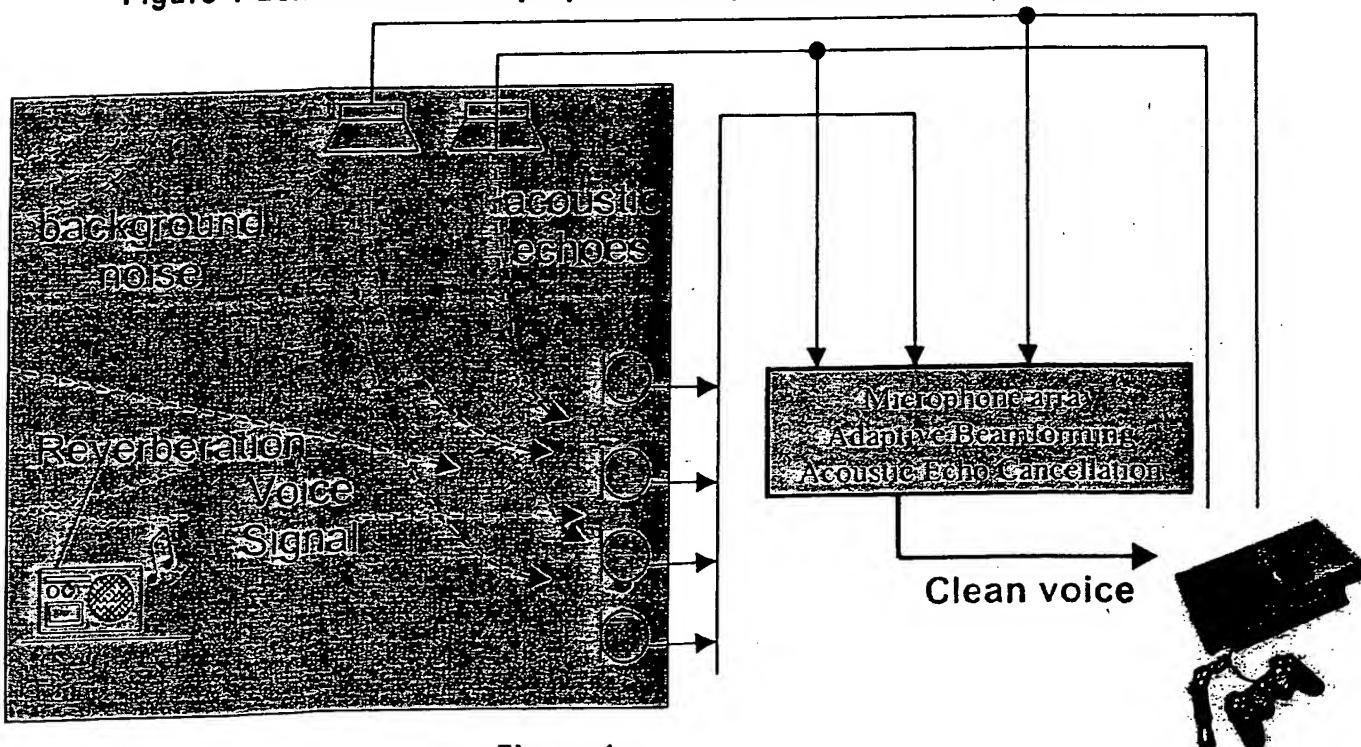


Figure 1

In a typical room with game console playing, the target voice signal is contaminated due to:

- Sound generated by game console itself, such as music, explosion, car racing, etc
- Music stereo, TV, Hi-Fi surrounding sound in background
- Environmental ambient noises, such as air conditioning, fans, people moving, door slam, outdoors activities...
- Competing voice from other game players
- Room acoustic reverberation

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Figure 2 gives two examples of sensor array placement on game controller

- (1) Four-Sensor-Equally-Spaced Straight-line array geometry
- (2) Eight-Sensor-Equally-Spaced Rectangle array geometry



Figure2-1



Figure2-2

Part 1: Microphone sensor setup

The number of sensors that may reasonably benefit the noise suppression software ranges from one, all the way up to more than twenties; it is limited solely by two factors: 1) the audio sampling rate, 2) available mounting area on the game controller. As long as the cost is considered, a price/performance balanced array system may constitutes anywhere in-between 2~6 sensors that makes up a equally spaced straight line array geometry, a better refined array geometry may involves 4 ~ 12 sensors to form a convex geometry (such as rectangle), thus, it is capable to provide not only the sound source direction (two-dimension) tracking as the straight line array does, but an accurate sound location detection in three-dimensional space is easily realized without significant computational burden, this added one more dimension can surely help the noise reduction software to achieve 3D spatial volume based array beamforming

The specification proposed in this document considers a rather practical straightline array system, but the method, the idea and the software algorithms running on top of it can be applied to any number of sensors involved, and as well as to any kind of array geometry setup

In the case of Four-Sensor based microphone array, we define the following hardware format:

1. The audio sampling rate is 16kHz
2. The geometry is equally-spaced straight line array, with a spacing of one half-wavelength at the highest frequency of interested, we select 2.5 cm (the frequency range is thus: 0 ~ 6.8 kHz)
3. Sequential A/D converter with 64 kHz sampling rate. Note, this A/D conversion introduces the maximum 4 degree beam direction error from